Beyond 2000

Predictions anyone?

By Gregg Grant

INTRODUCTION

No? I can't say I'm surprised. Nothing – someone once said – dates so rapidly as the future. When Aldous Huxley's Brave New World came out in 1932, most people thought it was a terrifying view of what lay ahead. In retrospect, it forecast nothing so much as the somaphoric drug culture of today.

George Orwell's bleakly depressing 1984 predicted neither computer control nor the re-emergence of the Spiv – tarted up for the 1980s – as the Yuppie. It did however tell its readers a great deal indeed about immediate, post-war Britain.

On another level the television series Star Trek is as good a guide as you can get to the hemlines of the 'swinging sixties' this side of a 60s revival edition of Vogue magazine. As to the realities of space travel…let that be!

This, you may say, is all very well. You've chosen some easy targets for a bit of good, knock-about journalism. OK, point taken. Now let's see if scientific technology has fared any better in the prediction game.

TRUST ME, I'M A SCIENTIST

When looking into the future, it seems logical to go to those who, the majority of us feel, are best placed to judge such matters: scientists and engineers. Sadly the record of scientists in the prediction business has been outstandingly undistinguished, to put it mildly. This appalling track record was encapsulated in a law in 1982, by no less a person than the science fiction writer and futurologist Arthur C. Clarke. This law states that 'when a distinguished but elderly scientist states that something is possible he is almost certainly right. When he states that something is impossible, he is very probably wrong.'

The evidence for this began to accumulate much earlier, the first inventor-originator to come up against the law being Galileo, in 1610. Under investigation by the Church for daring to suggest that Jupiter had moons, his views were forwarded to some professors of astronomy for their views. They replied to the Inquisition that since these so-called moons were invisible to the naked eye, they couldn't possibly have any influence on planet Earth. They obviously, therefore, didn't exist!

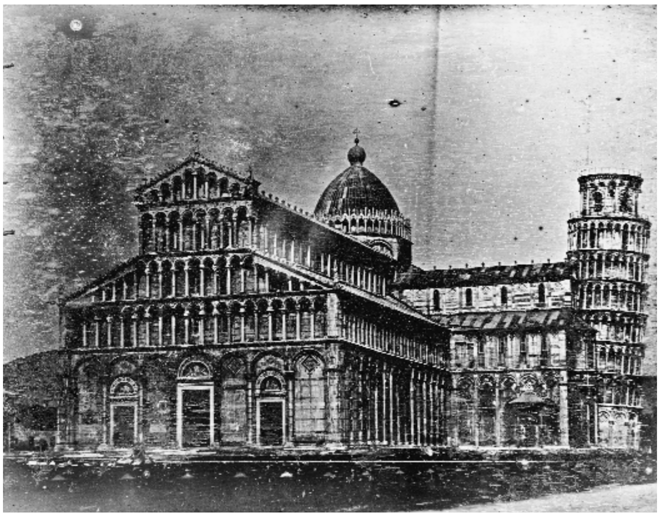

Figure 1. An early Daguerreotype illustration of Pisa, featuring the leaning tower, by Ellis, 1841. (Science & Society Picture Library)

TECHNOLOGY AND THE NEW MILLENNIUM

The advent of a new era is usually a time for reflection and stock-taking. The millennium currently approaching Platform Earth is no different. Reflecting on the progress of electronic technology over the second half of the millennium now passing away is sobering, to say the least.

To the Victorians and their successor, the Telegraph was the epitome of technical progress, along with the Trans-Atlantic cable system that was its highway. To pre-World War II Britons, the Television was no less marvellous. Yet, one has passed away, and the other is being changed significantly.

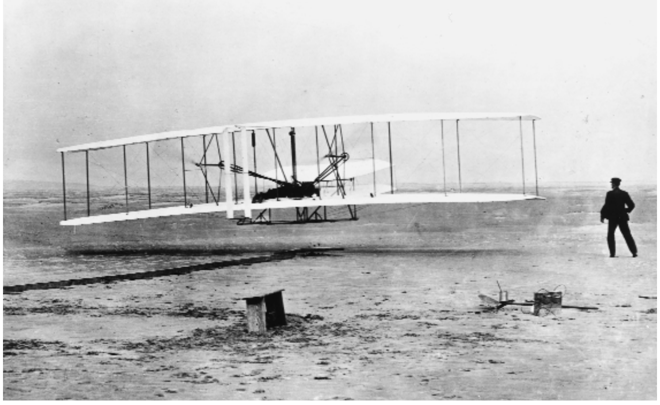

Figure 2. Orville Wright 1871–1948) making the first powered and sustained flight at Kitty Hawk, North Carolina, 17 December 1903. (Science & Society Picture Library)

In 1827, the German physicist Georg Simon Ohm published the law called after him, the first such law to link voltage and current to resistance in an electrical circuit. It was immediately denounced by a number of physicists and so-called electrical 'experts.' Indeed it would be 1841 before Ohm's work was vindicated, when the Royal Society awarded him its Copely Medal. Shortly thereafter, he began to be recognized for what he was: a clear-thinking original.

Just as the learned professors refused to look through Galileo's telescope, so would Louis Daguerre suffer from the arrogance of the 'experts' of his day. In 1839, he announced his process for creating a silver image on a copper plate, termed a daguerreotype. An early example of this is shown in Figure 1. This photograph, a view of Pisa, featuring the Leaning Tower, was dismissed by a variety of authorities, none of whom took the trouble to either talk to, or examine, the inventor or his method and process.

In 1896, that Victorian scientific icon Lord Kelvin – he of the temperature scale all scientists know and prefer – stated bluntly that he had 'not the smallest molecule of faith in aerial navigation other than ballooning.' Seven years later, this view became dated, to say the least.

As the Wright Brothers – shown in Figure 2 with the younger one, Orville, at the controls – were taking to the air in their earliest proving flights, they were attacked from another quarter. The Canadian-American astronomer Simon Newcomb – who knew a considerable amount about the earth's atmosphere – wrote an article whose ending was far from encouraging for what would rapidly become a new form of transport.

Newcomb explained that no conceivable combination of materials, machinery or motive power could be brought together in a vehicle that would lift into the air with a human being on board. A fortnight after his death in 1909, Louis Blériot became the first man to fly across the English Channel and the Englishman Henri Farman had completed the first flight of 100 miles duration.

Nor did matters improve as the century progressed. In 1937 Lord Rutherford – laden with distinctions and probably the greatest living experimental physicist – proved that his skills as a prophet were every bit as underwhelming as that of his predecessors. When a journalist asked what the effects of splitting the atom would be, Rutherford replied that if anyone jumped to the conclusion that a power source lay within the transformation of atoms, then that person was talking moonshine. Less than 20 years later the British nuclear engineer Christopher Hinton opened Calder Hall, in Cumbria, the world's first nuclear power station.

Nothing, perhaps, epitomizes the last half of the present century in quite the same way as spaceflight does. Yet it too had its detractors, not least the British Astronomer Royal, Sir Richard Woolley. In 1956, he stated that spaceflight was ‘utter bilge’. In the following year Sputnik, the world's first satellite, was launched.

Later Woolley, through his official position, became a member of the committee advising the United Kingdom (UK) government on - wait for it – space research! It need hardly be observed here that, by and large, the UK has never had anything that could be remotely termed a space programme.

ENGINEERS ARE NO BETTER

If scientists can hardly be said to be prescient, engineers are equally as lacking in foresight, as the development of electrical power shows.

By the final quarter of the nineteenth century, the inventive gifts and technical initiative of a number of individuals were making significant advances in developing electrical power for commercial and public utility applications.

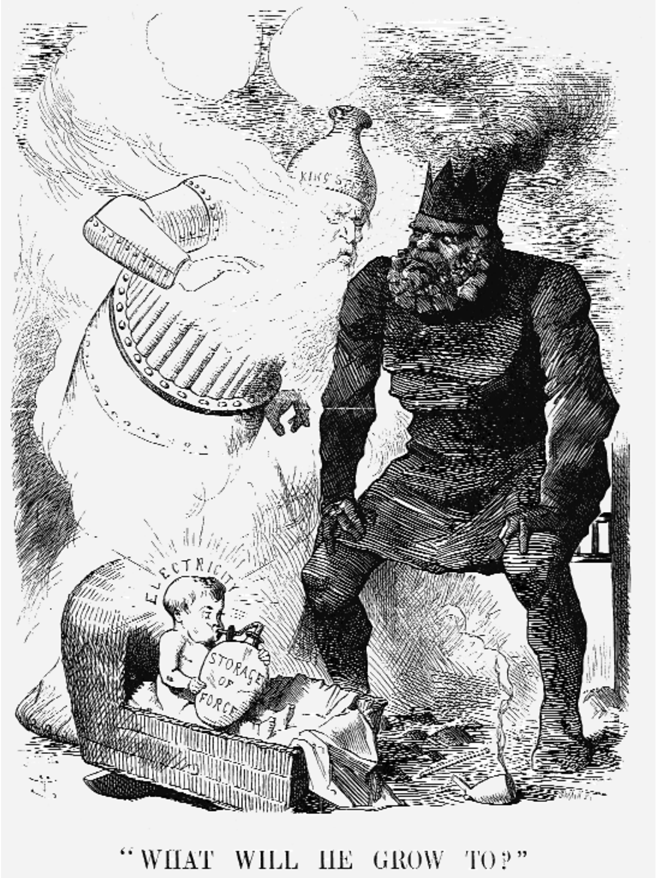

Figure 3. The Punch cartoon referred to in the text (25 June, 1881, reproduced with permission of Punch Ltd)

One of these developments would be roundly dismissed by no less a person than the Engineer-in-Chief of the British Post Office, Sir William Preece. His béte noir was the newly invented Electric Light of Thomas Edison, which, Preece thought was an absolutely fatuous development. In fact the humorous magazine Punch displayed far more foresight in its 1881 cartoon, shown in Figure 3, than Preece appeared capable of.

Nor was Thomas Alva Edison much better as a prophet of future trends, despite his 1,093 patents. Whilst well aware that his Phonograph for example could record music, he nevertheless thought that it would really come into its own as a device for recording the last words of the dying!

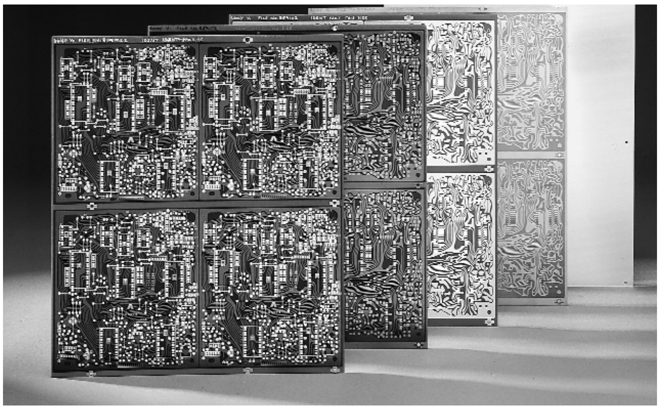

Figure 4. Five printed-circuit boards illustrating the various stages of manufacture in the 1980s. (Science & Society Picture Library)

In 1943, Thomas J. Watson, the founder of the International Business Machine (IBM) Corporation stated that, in his anything but humble opinion, the world market for computers would be small indeed. He envisaged no more than five being sold, world-wide.

Six years later, technical journalists proved that they too were just as disastrous at forecasting the future as everybody else had been. The American magazine Popular Mechanics, whilst acknowledging that ENIAC – the world's first general purpose computer – had 18,000 valves and weighed 30 tons, those of the future would be far more versatile. They'd probably require no more than 1,000 valves and weigh as little as 1.5 tons.

And this at a time when the valve was known to be cumbersome, inefficient and power-hungry to a degree. However, a replacement for the valve was being actively sought in a number of research laboratories, resulting in the transistor and integrated circuit. Today, most electronic circuits are made up of vast numbers of integrated circuits mounted on a printed-circuit board as illustrated in Figure 4

Sadly, it gets worse. In 1961, some 12 months before the launch of the world's first communications satellite, Telstar, the United States Federal Communications Commissioner T.A. Craven said that the chance of launching satellites to provide better television and telephone services was virtually nil!

And this, some 16 years after a former Royal Air Force (RAF) communications officer, one Arthur C. Clarke, had prophesied that the first use of satellites would be in the communications field.

So, how is it that science fiction writers are far better at the prediction game than scientists, engineers and technical journalists? After all very few of them – Arthur C. Clarke excepted – have had an engineering or scientific training.

That fine practitioner of the genre, Ben Bova, hinted that such a training was, in all probability, the least satisfactory background for a futurologist. Bova observed that no scientist or engineer, working for the majority of Western governments, would predict the sort of semi-accidental discovery – a good example of which is the integrated circuit – that would change the world. He highlighted the electronics industry circa 1950 as an illustration.

If, as Bova pointed out, a journalist had asked any government-employed engineer or scientist at this time how they saw the future of electronics evolving he – or she – would have got a fairly predictable reply. Far smaller valves, working at increasingly lower voltages added to an increasing use of plastic for the enclosures, would have been the limit of their imaginations.

At this time, however, science fiction writers were talking of two-way wrist radios and pocket-sized computers, not because they'd had an insight that silicon and germanium would subsequently prove to be the way ahead, nor because they had a hotline to Bell Labs. It was simply that their instincts told them that something had to be done about the sheer bulk of the electronic devices of the day.

History played a part too. The earliest steam engines – a good example of which is shown in Figure 5 – were massive, noisy and gluttonous of whatever fuel they used.

This was what could be called – indeed was – first generation technology. Compare Figure 5, however with Figure 6, the latter representing about a century of engineering progress.

To men like Bova, 1950s radio gear was the first generation technology of the electronics business. It seemed obvious therefore that progress would – broadly – follow much the same pattern as it had previously done with the steam engine, the internal combustion engine and a number of other machines.

Aware of the technology all around them – and the science underpinning it – they used both to drive their imaginations forward.

For scientists, engineers and technical and scientific journalists – the latter pair almost always coming from a scientific technology background – such everyday devices act as constraints, an advanced braking system on too vivid an imagination. Research funding, government patronage, career prospects and other forms of advancement all conspire to ensure that scientists, engineers and – yes -–even technical and scientific authors stay within the long established guidelines of their fields and/or professions. Little wonder therefore that no government or academically-employed researcher, engineer or scientist will upset this steadily trundling applecart.

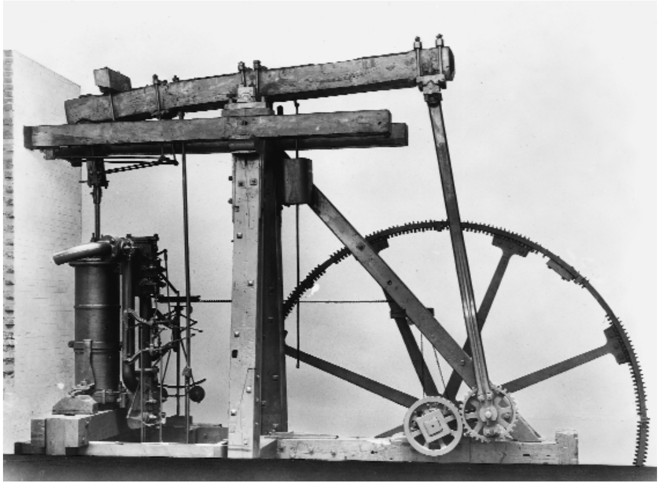

Figure 5. Boulton and Watt rotative engine of 1785. (Science & Society Picture Library)

THE FUTURE

We are – generally speaking – made by our materials and the machinery we fashion from them. Not for nothing have historians termed certain periods in our past the Stone Age, the Bronze Age and so on. Currently, we're in the Silicon Age and the major machine of our time is the computer.

When Isaac Newton published his *Principia* in 1687, the sophisticated machinery of the day was the clock. Newton looked on the workings of nature as an example of superb and elaborate clockwork. As the clock came to dominate everyday life, so the concept struck a powerful chord in the mind of man, one that took a great deal of shifting when, later, it became obvious that nature's clockwork was less than perfect.

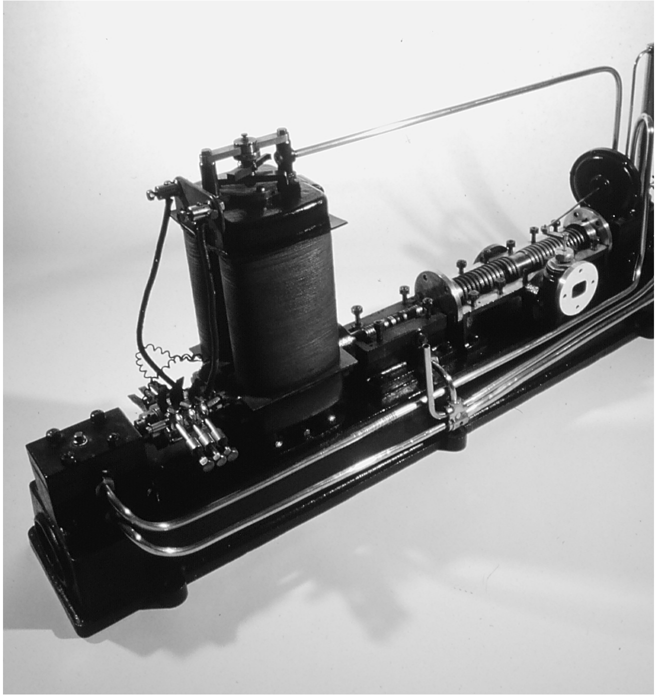

Figure 6. Parson's steam turbine and high-speed dynamo of 1884. (Science & Society Picture Library)

When John von Neumann put forward his concept of the series computer, arranged in what's come to be known as the von Neumann architecture in 1945, he created a machine which has dominated all our lives since. Look again at Figure 4: circuit cards such as these are familiar to virtually everybody who has a home computer. The device and its peripherals such as the Visual Display Unit (VDU) and laser printer, have had a profound effect on late twentieth century human beings: we have been conditioned by its structure, operating technique and general ergonomics.

Given this, I sense that a number of powerful factors – and people for that matter – will ensure that they become, if I can put it this way, the Newtonian clock paradox of the next couple of hundred years or so.

Therefore, when looking into the future – no matter how far – we should be aware of being too influenced by our present, by what we're familiar and comfortable with. One modern example of how attached we've become to what's familiar, what's part of our mindset, is the shape and size of the TV and VDU screens we use.

Indeed if any area is ripe for improvement this is it. Already the Laptop computer has pointed the way to a far smaller, slim-screen future. Shortly, too, we'll have to find a successor to silicon for there is – at most -–about one more order of magnitude to be had from present-day integrated circuit manufacturing techniques.

Will we succeed in these and other developments, many of which we can only vaguely envisage? Of course we will! Why? Simply because, as Arthur C. Clarke pointed out long ago, if something is desired by a sufficient number of people, however unlikely the 'something' may seem at present, it will be achieved eventually. And we have proof of this: simply look back at the twentieth century!

[995019]